



Brick Masonry

INTRODUCTION

In brick masonry, the bricks are arranged and bedded in mortar so as to form a wall. In this process, uniform units of bricks are placed with one hand and these bricks are laid in courses with the mortar joints to form walls.

MATERIAL USED IN BRICK MASONRY

The common materials employed for brick masonry construction are:

- (1) Brick
- (2) Mortar



Fig. 2.1: Brick and mortar

Brick

A brick is a building material used to make walls, pavements and other elements in masonry construction. Bricks are manufactured by moulding the earth in rectangular blocks of uniform size and shape. The bricks can be manufactured of any shape and size as per the requirement. The standard size of a brick is kept as 19×9×9 cm.

Their nominal size is considered as 20×10×10cm. Generally, the first and second class bricks are used for brick work. Bricks should be tested for hardness and durability before they are used in masonry.

Mortar

Mortar is a mixture prepared by mixing cement with sand. Water is added to prepare the mixture. Mortar keeps the stones in desired position. It is placed between the joints. Mortar is classified as per its use; the usage depends on the load coming on the structure, strength required, resistance desired for weathering agencies, etc. Lime mortar, cement mortar, cement lime mortar and lime cement mortar are different types of mortar.

TOOLS REQUIRED FOR BRICK MASONRY

The various tools commonly used to form a brick layer are:

Trowel

It is the most important tool used in brick masonry. It is available in sizes varying from 5 cm to 30 cm in length. Trowels are used for lifting and spreading mortar for forming joints and also for cutting bricks.

Plumb Bob and Rule

It is in the form of a smooth wooden piece of 2 m length, 10 cm width and 1 cm thickness with its long edges parallel to each other. It is used for checking the verticality of the faces of brick work.

Straight Edge

This tool is used for checking the alignment of faces of brick work of a wall or pillar.

Mason's Square

This is a right angled piece made of steel or wooden section. It is used for checking right angles.

Spirit Level

This tool is used along with the straight edge for checking the levels of floors, roofs, etc.

BRICK MASONRY

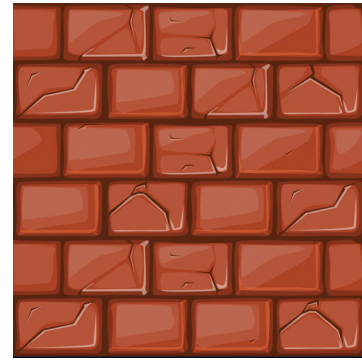


Fig. 2.2: Mortar in brick joining



Fig. 2.3: Trowel



Fig. 2.4: Plumb bob and rule



Fig. 2.5: Straight edge



Fig. 2.6: Mason's square



Fig. 2.7: Spirit level

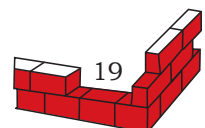




Fig. 2.8: Steel tape



Fig. 2.9: Brick hammer

Steel Tape

This is usually a steel tape having millimeters length marked up to one tenth of a centimeter. It is useful for checking small measurements.

Brick Hammer

One end of this hammer is square and the other end is sharp edged. It is used for cutting bricks in different shapes and sizes, brick paving, striking nails, etc.

TECHNICAL TERMS USED IN BRICK MASONRY

Bond

During construction work, the arrangement of laying of bricks is known as a bond. These adjacent bricks are joined with each other with the help of cement mortar. Various terms are described below, which are used for bond as per the arrangement of bricks.

Course

A horizontal layer of bricks is termed as a course.

Stretcher

When the bricks are laid lengthwise or in the direction of a wall, then it is called stretcher.

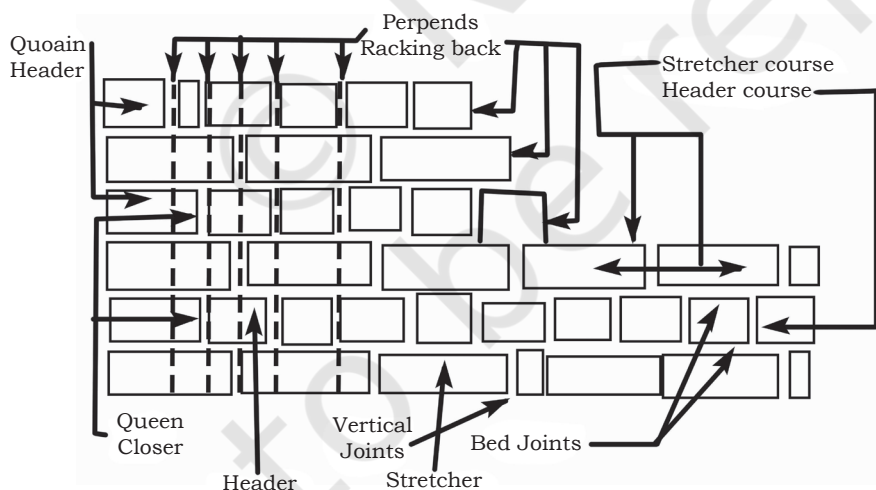


Fig. 2.10: Elevation of a masonry wall

Stretcher Course

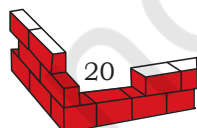
In this, the bricks are laid as stretchers. It is used for the partition of a wall.

Header

When the bricks are laid breadth or width wise, it is known as a header.

Header Course

When the bricks are laid as headers, it is known as header course.



Arises

The edge formed by the intersection of plane surface of a brick is called the arises and they should be sharp square and not damaged or chipped.

Perpend

The vertical joints separating the bricks in either length or cross direction are known as perpend. For a good bond, the perpend in alternate courses should be vertically one above the other.

Bed Joints

The horizontal layer of mortar upon which bricks are laid is known as a bed joint.

Lap

The horizontal distance between vertical joint in successive courses is termed as a lap and for a good bond, it should be one-fourth of the length of a brick.

Closer

A piece of brick which is used to close up the bond at the end of brick course is known as a closer. These are used for forming a proper bond in brick masonry. The types are:

(a) Queen closer

This is placed next to the first brick in a header course. This is a half brick cut longitudinally.

(b) King closer

To obtain a king closer joint, a brick is cut through length and width in such a way that a triangular portion is formed on the adjoining cut faces.

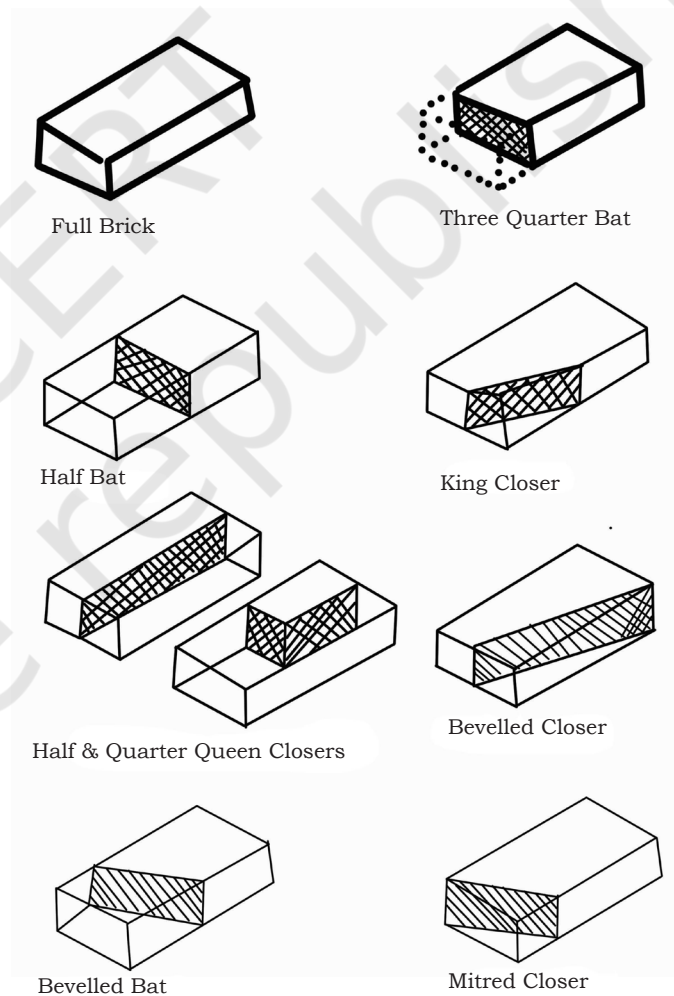


Fig. 2.11: Types of Closers and Bats

(c) Bevelled closer

The portion of a standard brick made by cutting a triangular piece between the centre of one header face and the opposite corner of the stretcher face is termed as bevelled closer.

(d) Mitred closer

The portion of a standard brick having its one end cut splayed or mitred for the full width is called a mitred closer (Fig. 2.11).

Bull nose

The bricks moulded with a rounded angle is termed as bull nose and it is used for constructing the rounded corners of buildings.

Cow nose

A standard brick having its both edges rounded off is called cow nose or double bull nose.

Plinth and plinth level

The portion of a structure between the surface of surrounding ground and the surface of the floor immediately above the ground is known as plinth and the level of the top of plinth with respect to surrounding ground is known as plinth level.

Jambs

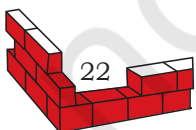
The vertical sides of a door or window opening which support the door or window frame is called jambs.

Soffit

The under surface of an arch or lintel provided over a door or window or verandah opening is called soffit.

Bond

As we know, when bricks are laid adjacent to each other forming a groove in between the bricks which is filled by cement mortar, is called a bond. Bonding helps in even distribution of loads over a large area. Bonds are classified in different types.



English Bond

This bond consists of alternate course of headers and stretchers (Fig. 2.12). Queen closer, i.e., half of the brick cut lengthwise, shall be introduced after first header to break the vertical joint.

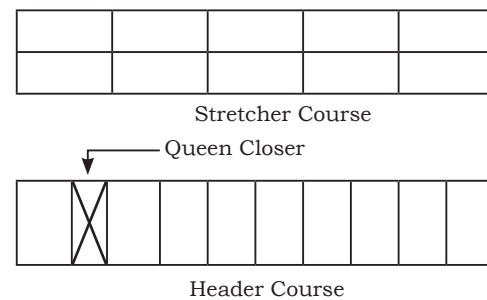


Fig. 2.12: English Bond

Flemish Bond

In this arrangement of bonding brickwork, each course consists of alternate headers and stretchers. The headers of each course are centred over the stretcher in course below. For breaking of vertical joints in successive courses, closers are inserted in alternate courses next to quoin headers (arrangement of bricks) (Fig.2.13).

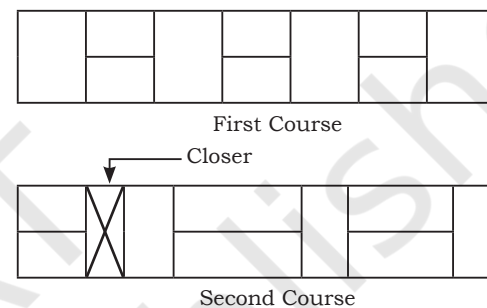


Fig. 2.13: Flemish Bond

GENERAL PRINCIPLES TO BE OBSERVED IN BRICK MASONRY CONSTRUCTION

While supervising the construction of a brick wall the following points should be observed.

1. The brick to be used for masonry work should be well burnt and of uniform size.
2. All the bricks to be laid in cement or lime mortar must be properly soaked in water for at least two hours before they are used in construction work.
3. All the bricks should be laid with their frog upwards so that the mortar should be properly filled in the frog and should form a key with mortar joint of the succeeding course.
4. Specified mortar of good quality should be used.
5. All joints of the masonry should be of uniform thickness and the thickness of each joint should not exceed 1 cm.
6. A systematic bond must be provided throughout the masonry work.
7. The verticality of the brick work should be frequently checked by means of a plumb rule.

8. The upper surface of the wall should be wetted properly before a new layer is laid over it so as to form a bed for the new work.
9. The brick work should be uniformly raised throughout the length of the wall in proper bond to avoid any unequal settlement.
10. In one day, the height of brick masonry construction should not exceed 1.5 metres.
11. While constructing a long wall, each successive portion should be properly raked back and the old and new brick work should be joined according to the bond.
12. Brick bats should be used to the minimum.
13. When timber or iron work is to be embedded in the wall, the timber must be coated with coal tar and the iron work to be laid either in cement mortar or cement concrete.
14. Freshly laid brick work should be protected against rains during construction.
15. During frosty weather, the brick work should either be suspended or carried out in cement mortar, if essential.

METHOD OF LAYING BRICKS FOR THE WALL

The following are the steps adopted in the construction of walls.

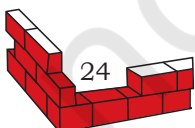
Selection of Bricks

Bricks are selected for different parts of the wall i.e., for facing, hearting and backing.

Wetting of Bricks

Before the bricks are laid in the walls, they should be wetted on all sides. The reasons for wetting bricks are:

- (i) The bricks will tend to spread the mortar under them more evenly.
- (ii) They will adhere better to the mortar.



- (iii) A dry brick will quickly absorb water from mortar and water is needed for setting of cement mortar.
- (iv) Wetting of bricks washes the kiln dust from them. A clean brick will produce a better joint and bed with mortar.

Preparation of Mortar

The mortar to be used for brick masonry is prepared the required quantity at one time. The quantity of mortar should be such that it can be used within half an hour after its preparation.

Laying of Bricks in Walls

Laying of bricks in wall is done in the following two steps:

- (a) Laying of bricks in foundation i.e., up to plinth level
- (b) Laying of bricks in wall above plinth level

Laying of bricks in foundations

This is done by following the given steps:

(i) Spreading mortar on concrete bed

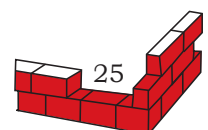
About 2 cm thick layer of prepared mortar is first spread on the top of concrete bed in the area to be occupied.

(ii) Constructing corners

After spreading the mortar, the extreme corners are constructed in two courses after leaving the required concrete offset on each side. Surfaces of these extreme corners are made truly plumb.

(iii) Laying first course

First of all, two strings are stretched at the upper level between extreme corners to mark the external and internal edges and to lay the bricks in the line and level with corner bricks of this course. Then bricks are laid on the layer of mortar in between these strings till the first course is completed.



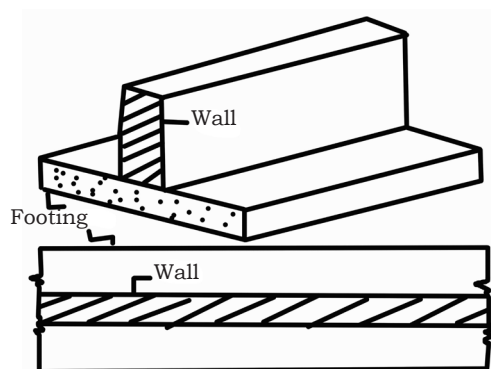


Fig. 2.14: Simple footing in brickwork

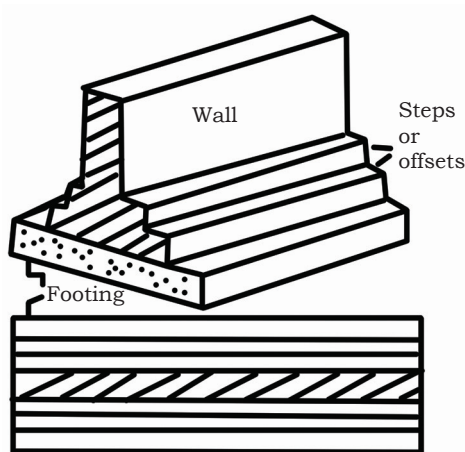


Fig. 2.15: Spread footing in brickwork

(iv) **Laying second course**

In second course, two strings are stretched at the upper level between the extreme corners and bricks are again laid on the layer of mortar till it is completed. Similarly, the remaining steps of foundations of wall are completed after leaving the bricks offset (Fig. 2.14).

Laying of bricks in wall above plinth level

First, a layer of 2 cm of thick mortar is spread on the top of plinth course in the area to be occupied by the corners of the wall. Then the extreme corners of the wall are constructed in the required bond up to 3–5 course in height. The base of each corner is extended in steps as shown in figure 2.15. The surfaces of the corners are made truly plumb. After this, each course is completed in turn by stretching two threads at its upper level between the extreme corners to work the external and internal edges of the wall. In each course selected bricks for facing work are laid first in line and levelled with the external thread and then other bricks

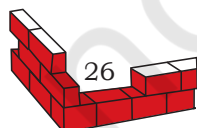
are laid in between the internal thread. When the masonry work up to the top of these extreme corners is completed, extreme corners of 3 to 5 courses in height are again constructed and this process is repeated till the wall is constructed up to a height of 1.5 m from ground level.

METHODS OF FIXING NEW BRICK WORK WITH OLD BRICK WORK

- (1) Toothing
- (2) Racking back
- (3) Block bonding

Toothing

Toothing is the process of leaving alternating openings (teeth) for an adjoining brick wall to be started from. This



makes the adjoining wall to be started without having to adjust or cut the brick. This method is used when a partition wall is proposed to be connected with the main wall or when rest of the building portion is to be constructed afterwards. The length of recesses left in the wall is kept equal to the thickness of the proposed partition wall and their depth is equal to $1/4$ brick or 5 cm. Tothing is done so that the new cross or partition wall or rest of the wall can be bonded to the existing wall properly.

Racking Back

This method is useful when full length of the wall cannot be built at one time. In this method, the full length of the wall is constructed in parts and each successive portion is racked back. Racking back is done to reduce the possibility of any settlement of cement plaster in freshly laid portion of the wall.

Racking Back refers to the stepping back of courses of brick during the construction phases of a wall. This method is used for fixing new brick work with the old brick work.

Block Bonding

This method is used for joining a new course or partition wall to existing main wall. The process of creating recesses in height after every three courses in the existing main wall is called block bonding.

DEFECTS IN BRICK MASONRY

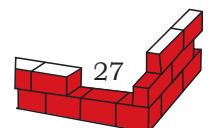
Common defects occurring in brick work are:

- (i) Sulphate effect on mortar
- (ii) Use of unsound material
- (iii) Frost action
- (iv) Efflorescence

Effect of Sulphate on Mortar

Exposure to sulphate causes cracking of brick work, spalling of brick edges, deterioration of mortar and falling off the plastered surface. The cause of this failure is chemical action that takes place between the sulphate salts present in bricks and aluminium constituent of the portland cement.

This action is rapid in the presence of water. Prevention of moisture penetration will avoid this effect to a large extent.



Use of Unsound Material

When sub-standard material such as under burnt or over burnt bricks, poor quality mortar, etc., are used, it may result in dampness, cracking and early failure of the structure. To overcome this defect, materials of good quality should be used.

Frost Action

Defects due to frost action would cause cracking in the brick work. Prevention of water accumulation would go a long way in reducing this defect.

Efflorescence

The accumulation of white deposits on the exposed surfaces of bricks in brick masonry is called efflorescence.

It is due to the crystallisation of salts present in the bricks or absorbed by them from the soil in contact with the brickwork. This provides an ugly appearance and may cause disintegration of the brick work. To overcome this defect, sound bricks in good mortar should be used in brick work. Damp-proof course should be well designed and provided properly in the required position to overcome dampness in the brick work.

MAINTENANCE OF BRICK MASONRY

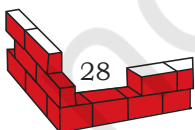
Maintenance is done to ensure neat appearance and stability of the brick work. Following steps are generally executed for proper maintenance.

Cleaning Brick Masonry

Cleaning of brick masonry is done to ensure the neat appearance of brick work, cleaning is done either by steam or hot water jets.

Removing Efflorescence

Efflorescence is removed by rubbing the surface of brick masonry with wire brush and then washing with water. If this is not effective, the surface is treated with a 10percent solution of muriatic acid and then washed immediately with plain water.



Reconditioning of Brick Masonry

To ensure the neat appearance and reconditioning of brick masonry, repointing or replastering is done.

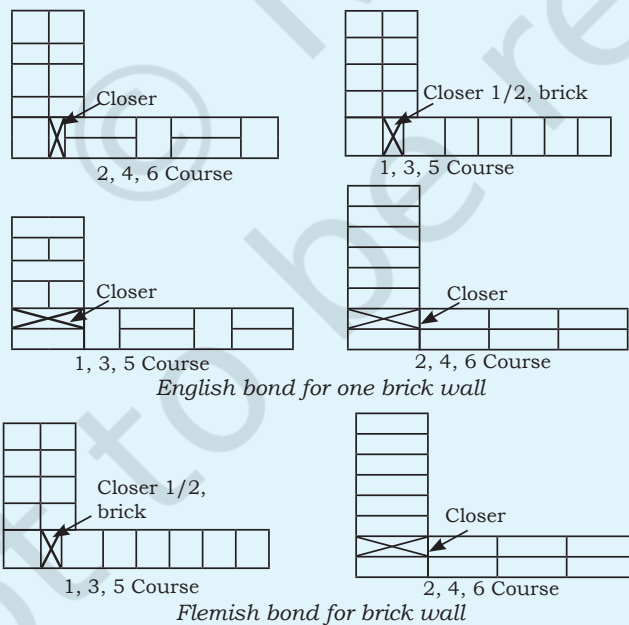
For repointing the loose mortar from the joints, loose mortar is removed to a depth of about 3 mm. The joints are then cleaned by means of a wire brush and washed with water. After this, the joints are finished with fresh mortar.

For replastering, loose plaster from the surface is removed to a depth of 3 mm. The surface is then cleaned with water. After this, the surface is replastered.

Practical Exercise

These activities are to be done under the supervision of teacher in the school premises.

1. Perform the stacking of bricks and counting of bricks as per the laid standard procedure.
2. Construct English bond of one brick's thickness without mortar.
3. Construct English bond of one and half brick's thickness without mortar.
4. Construct double Flemish bond of one brick's thickness without mortar.
5. Construct single Flemish bond of one and half brick's thickness without mortar.
6. Prepare different types of closers.
7. Prepare different types of brick bats.
8. Construct English bond and Flemish bond as per the drawing given below.



Check Your Progress

A. Short Answer Type Questions

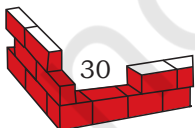
1. Give the general principles to be observed and precautions to be taken during the construction of brick masonry.
2. Define the following with diagrams.
 - (i) King closer
 - (ii) Queen closer
 - (iii) Standard brick
 - (iv) Bull nose
3. What is a bond in masonry? Why is it necessary?
4. Why are joints broken in masonry?
5. Explain the following terms:
 - (i) Toothing
 - (ii) Racking back
 - (iii) Block bonding

B. Fill in the blanks

1. A horizontal layer of bricks is termed as a _____.
2. Course of brick work in which all the bricks are laid as headers are called as _____ course.
3. Bricks are manufactured by _____ the earth in rectangular blocks of uniform size and shape.
4. Trowels are used for _____ and _____ mortar for forming joints and also for cutting bricks.
5. Plumb rule and bob are used for checking the _____ of the faces of brick work.
6. In the stretcher course of brick work, all the _____ are laid as stretchers.
7. Straight edge is used for checking the _____ of faces of brick work of a _____ or pillar.
8. _____ is a brick laid with its breadth or width parallel to the face or front or direction of a wall.

C. Multiple Choice Questions

1. Trowel is an important tool used for _____.
 - (a) Brick masonry
 - (b) measurement of item
 - (c) breaking the stone
 - (d) measuring the distance
2. The shape of the brick hammer is square on one end and the other end is of _____.
 - (a) oval shape
 - (b) sharp edged shape
 - (c) flat shape
 - (d) round shape



3. Jambs is a term used to denote the _____ or window frame.
(a) horizontal side of door (b) vertical side of door
(c) lateral side of door (d) none of these
4. _____ is a defect of frost action.
(a) Cracking in the brick work
(b) Tightening in the brick work
(c) Hardening in the brick work
(d) None of these
5. Brickbat is also known as _____.
(a) Full brick (b) Half brick
(c) Powder brick (d) None of these

D. Long Answer type Questions

1. What are the common defects in brick masonry?
2. What are the advantages and disadvantages of English bond and Flemish bond?
3. Enlist the different types of bonds used in brick masonry.
4. Describe the procedure of laying of bricks in a wall.
5. Differentiate between English bond and Flemish bond.
6. Explain the tools used in brick masonry.

